

## **ABSTRACT**

A fuel cell system including a housing defining an anode chamber and a cathode chamber and including a catalyst, a protonically conductive, but electronically non-conductive membrane positioned between the anode chamber and the cathode chamber and a first vent, a fuel chamber in gaseous communication with the anode chamber via a first valve, a liquid chamber in gaseous communication with the anode chamber via a second valve, and a mixing chamber having a second vent. The mixing chamber is in gaseous communication with the anode chamber via a third valve and receives fuel from the fuel chamber through a fuel valve, liquid from the liquid chamber via a liquid valve, and liquid effluent from the anode chamber via a liquid effluent valve. The mixing chamber also provides a fuel mixture to the anode chamber via a fuel mixture valve. Using effluent gases, the present invention drives fluids between elements of the fuel cell system.